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(54) **WELLBORE ELECTRICAL ISOLATION SYSTEM**

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E21B 17/10	(2006.01)
E21B 47/06	(2012.01)
E21B 47/12	(2012.01)
E21B 17/042	(2006.01)

(52) **U.S. Cl.**
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(58) **Field of Classification Search**
CPC E21B 17/003; E21B 17/042; E21B 17/1042; E21B 17/1078; E21B 47/06; E21B 47/065; E21B 47/122
See application file for complete search history.

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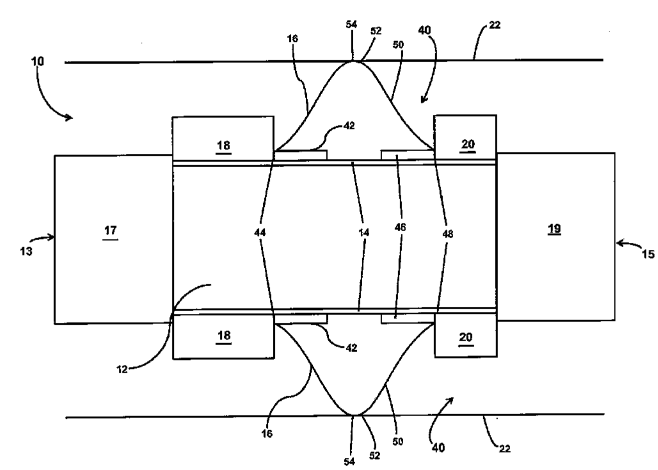
(57) **ABSTRACT**

This disclosure relates to a wellbore electrical isolation system and method. The system may comprise an electrically conductive tube, an insulating layer covering at least a portion of the tube, an electrically conductive centralizer, electrically insulating confinement devices, and/or other components. In some implementations, the system may be configured to electrically isolate one or more sections of an electrically conductive well tubing string from an electrically conductive wellbore casing. In some implementations, a well may include one or more wellbore electrical isolation systems. Electrical isolation of the tubing string from the casing may facilitate powering one or more electrical loads disposed within the wellbore via a coaxial transmission line formed by the casing and the tubing string.

20 Claims, 5 Drawing Sheets



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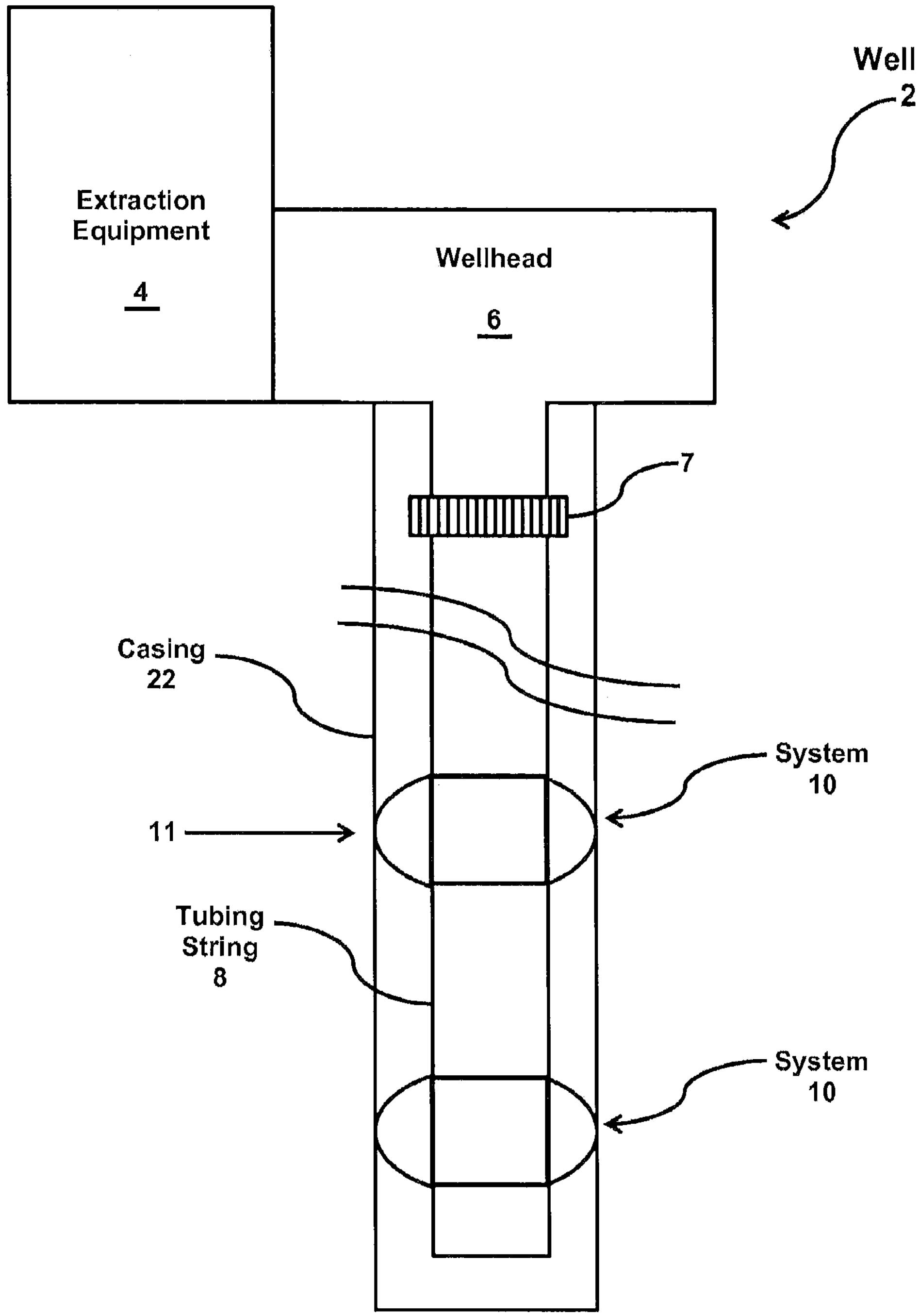
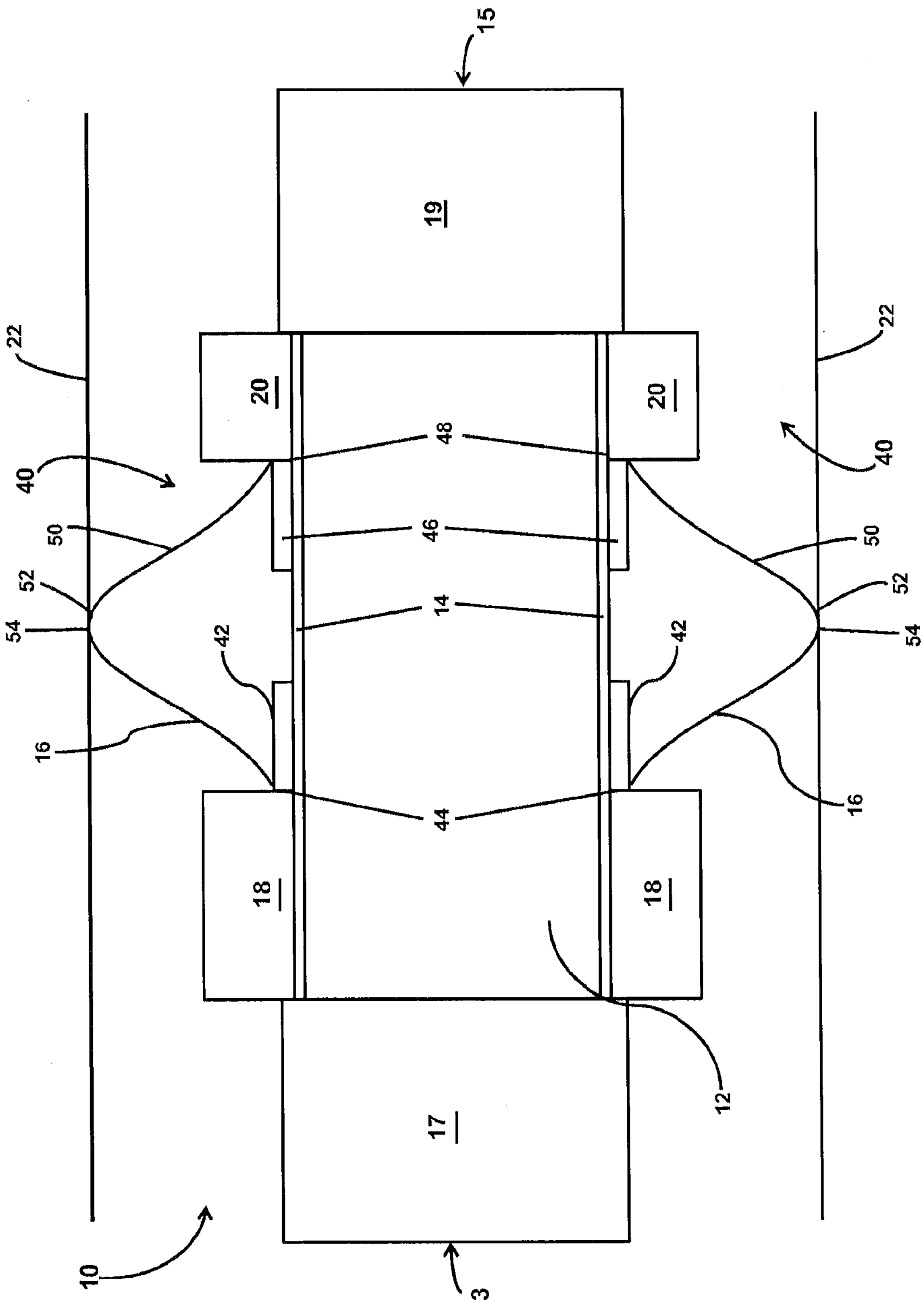

Extraction
Equipment
4
Wellhead
6
Well
2
7
Casing
22
System
10
11
Tubing
String
8
System
10

FIG. 1


15
19
22
22
20
20
48
40
40
50
46
50
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14
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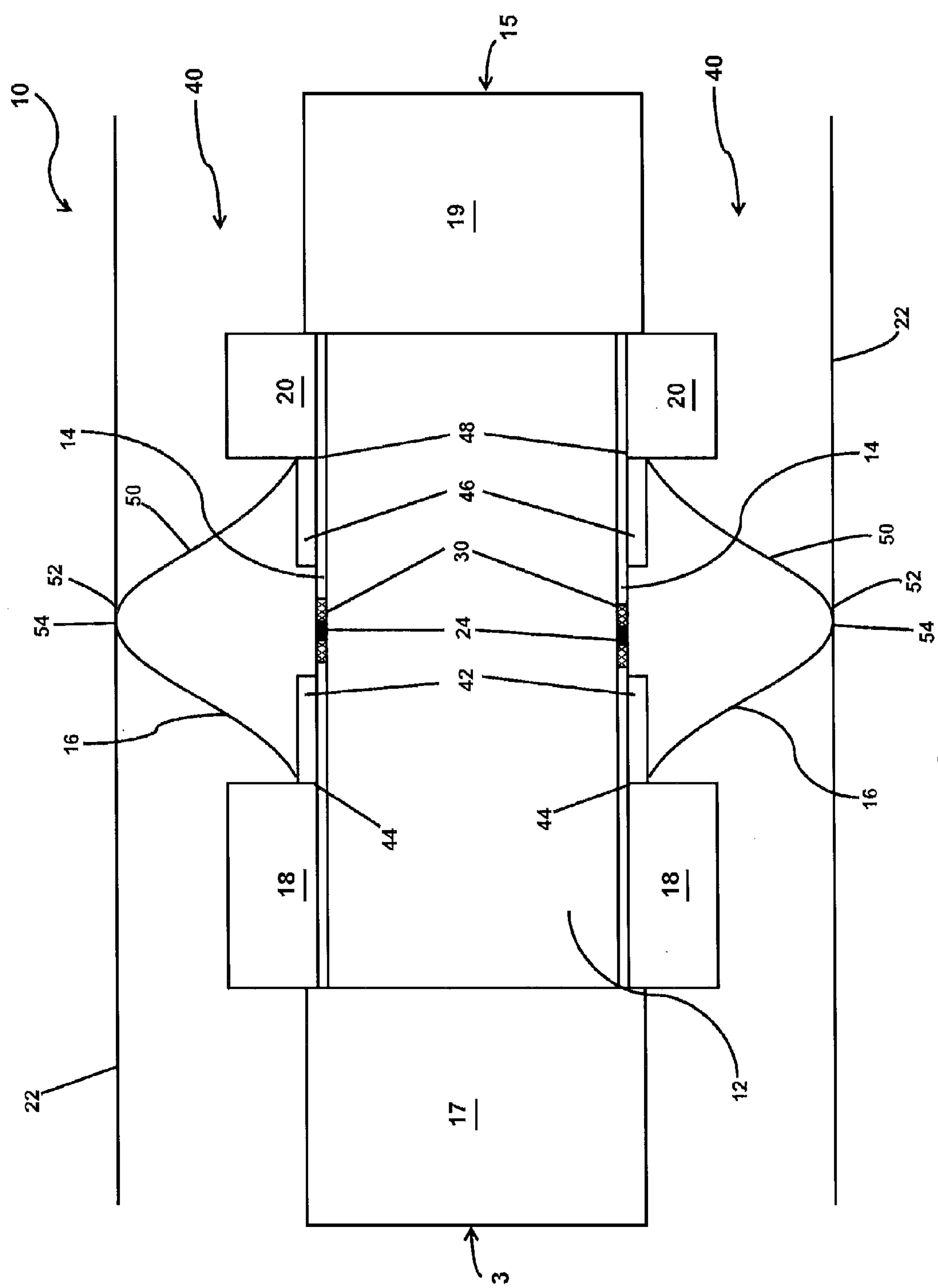
42
42
16
16
44
18
18
12
17
10
13

FIG. 2


10
40
15
40
19
22
20
20
14
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14
50
46
50
52
30
52
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24
54
42
16
16
44
44
18
18
12
22
17
13

FIG. 3

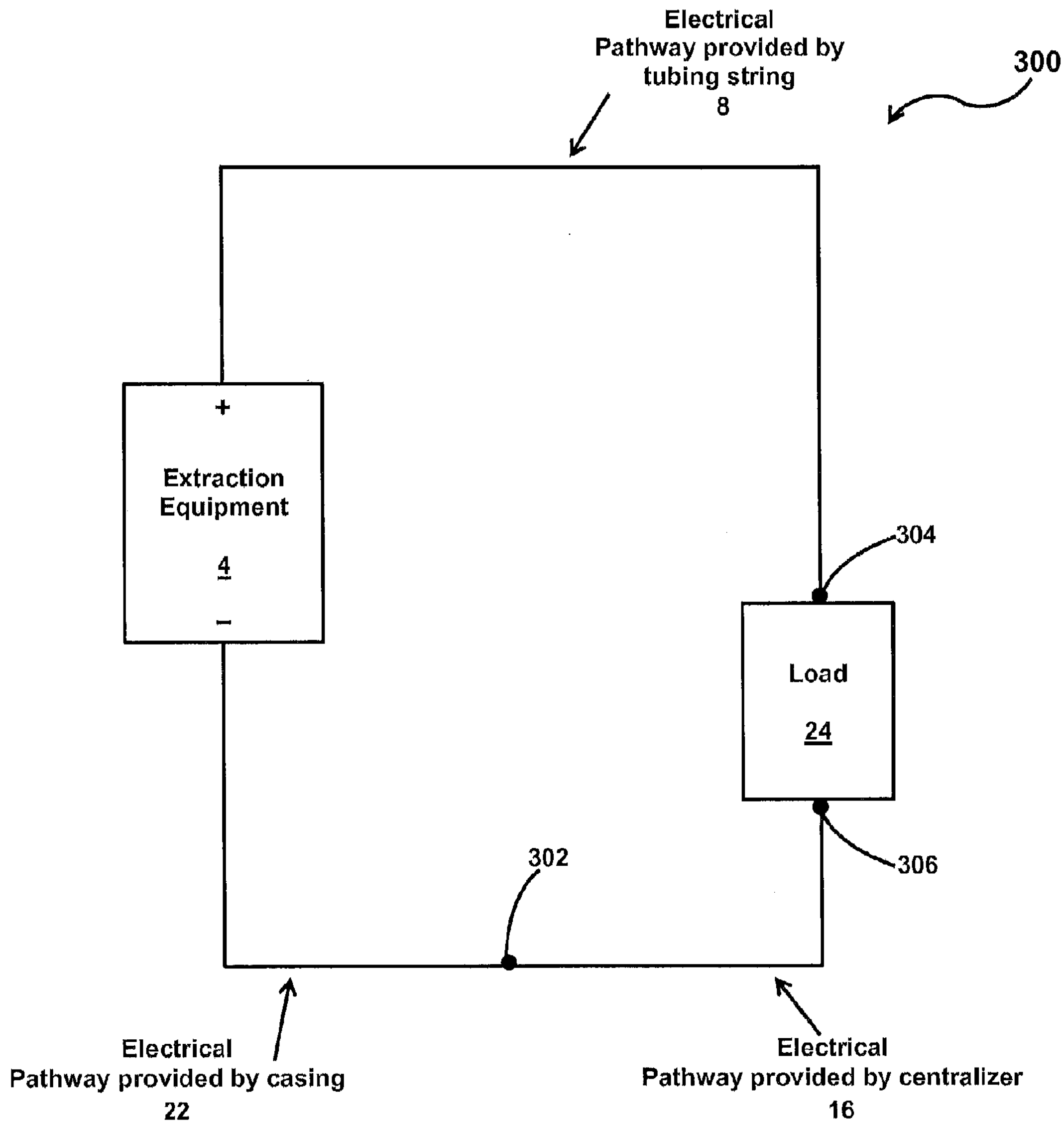
Electrical
Pathway provided by
tubing string
8
300
+
Extraction
Equipment
4
–
304
Load
24
306
302
Electrical
Pathway provided by casing
22
Electrical
Pathway provided by centralizer
16

FIG. 3A

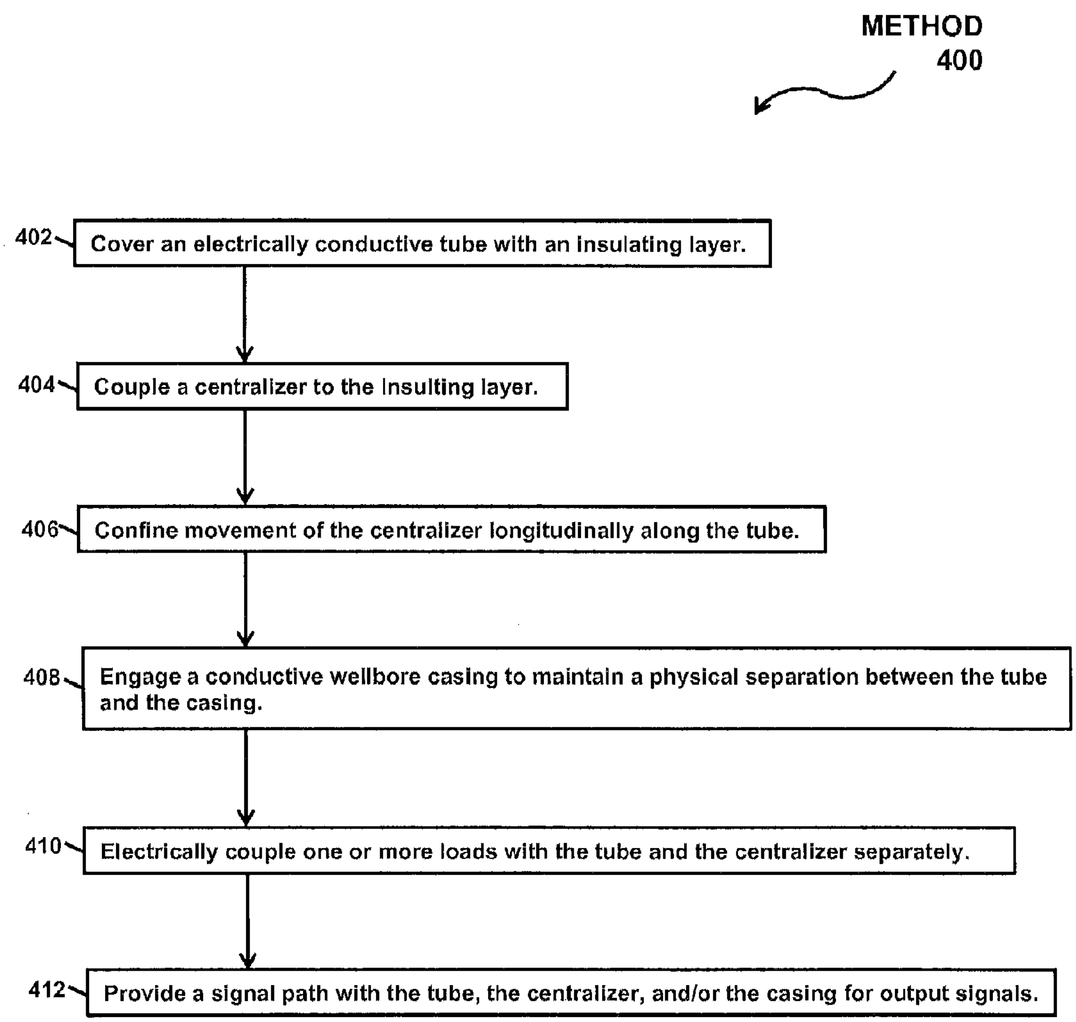
METHOD
400
402
Cover an electrically conductive tube with an insulating layer.
404
Couple a centralizer to the insulting layer.
406
Confine movement of the centralizer longitudinally along the tube.
408
Engage a conductive wellbore casing to maintain a physical separation between the tube and the casing.
410
Electrically couple one or more loads with the tube and the centralizer separately.
412
Provide a signal path with the tube, the centralizer, and/or the casing for output signals.

FIG. 4

WELLBORE ELECTRICAL ISOLATION SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

This is the U.S. National Stage of PCT/US2014/024009, filed Mar. 12, 2014, which in turn claims the benefit of priority from U.S. Provisional Application No. 61/779,936, filed Mar. 13, 2013, the entire contents of all applications are incorporated herein by reference in their entirety.

FIELD OF THE DISCLOSURE

This disclosure relates to a wellbore electrical isolation system and method for electrically isolating one or more sections of a tube from a wellbore casing.

BACKGROUND

Systems for sensing characteristics of wellbores without wiring are known. Typically, an electrical connection to a wellbore casing and a tubing string powers one or more down hole gauges and/or actuators from a single installation point. A voltage and current sufficient to drive the gauges and/or actuators must exist across the tubing string and casing at the installation point to provide power to the gauges and/or actuators. Currently, systems for wireless sensing are limited to one or more gauges and/or actuators powered from a single installation point because the voltage and current across the tubing and casing beyond the installation point of the gauges and/or actuators is not sufficient to power additional gauges and/or actuators.

SUMMARY

One aspect of the disclosure relates to a wellbore electrical isolation system. The system may comprise an electrically conductive tube, an insulating layer covering at least a portion of the tube, an electrically conductive centralizer, electrically insulating confinement devices, and/or other components. In some implementations, the system may be configured to electrically isolate one or more sections of an electrically conductive tubing string from an electrically conductive wellbore casing. In some implementations, a well may include one or more wellbore electrical isolation systems.

Electrical isolation of the tubing string from the casing may facilitate powering one or more electrical loads disposed within the wellbore via a coaxial transmission line formed by the casing and the tubing string. In some implementations, the tubing string may have a positive polarity and the casing may have a negative polarity. By way of an electrical engagement between the casing and the centralizer, the centralizer may also have a negative polarity. In some implementations, a given electrical load may be electrically coupled with the positive tubing string and separately coupled with the negative centralizer. The centralizer and the tubing string may be electrically isolated from each other by the insulating layer covering at least a portion of the tube. This arrangement may allow additional electrical loads to be deployed in the same and/or similar manner distally (down hole) from the given electrical load.

The electrically conductive tube may have a first end and a second end. At least a portion of an outside diameter of the tube between the first end and the second end may be covered with the electrically insulating layer.

The electrically conductive centralizer may be coupled to the insulating layer. The centralizer may be coupled to the insulating layer such that the centralizer and the tube are electrically insulated from each other. Movement of the centralizer longitudinally along the tube may be confined by a first electrically insulating confinement device toward the first end of the tube and a second electrically insulating confinement device toward the second end of the tube. The centralizer may be configured to engage the conductive wellbore casing to maintain a physical separation between the tube and the casing. The electrical insulation between the centralizer and the tube may isolate the tube electrically from the casing.

In some implementations, the casing may be configured to surround the tube, the insulating layer, the centralizer, the first confinement device, the second confinement device, and/or other components of the system.

In some implementations, the system may include the one or more loads electrically coupled with the tube and the centralizer separately. The one or more loads may include one or more sensors, one or more actuators, and/or other loads. The one or more sensors may include one or more of a temperature sensor, a pressure sensor, a flow rate sensor, a voltage sensor, and/or other sensors. The one or more actuators may include a valve, and/or other actuators. The one or more loads may communicate with an interior of the tube. The one or more loads may be configured to generate output signals conveying information related to operation of a well. The information related to the operation of the well may include one or more of information related to a temperature in the tube, a pressure in the tube, a flow rate of material through the tube, the operational state of a valve (e.g., open, closed, partially open), and/or other information. The tube, the centralizer, the tubing string, the casing, and/or other components of the well may be configured to provide a signal path for the output signals.

In some implementations, the wellbore electrical isolation system may be a pup joint assembly. The first end and the second end of the tube are threaded such that the system may be coupled in line with the tubing string.

Another aspect of the disclosure is related to a method for electrically isolating well components with a wellbore electrical isolation system. The method may comprise covering, with an electrically insulating layer, an electrically conductive tube having a first end and a second end, wherein at least a portion of an outside diameter of the tube between the first end and the second end is covered with the insulating layer. The method may comprise coupling an electrically conductive centralizer to the insulating layer such that the centralizer and the tube are electrically insulated from each other. The method may comprise confining movement of the centralizer longitudinally along the tube with a first electrically insulating confinement device toward the first end of the tube and a second electrically insulating confinement device toward the second end of the tube. The method may comprise engaging, with the centralizer, a conductive wellbore casing to maintain a physical separation between the tube and the casing, wherein the electrical insulation between the centralizer and the tube isolates the tube electrically from the casing.

The method may comprise surrounding, with the casing, the tube, the insulating layer, the centralizer, the first confinement device, the second confinement device, and/or other components.

The method may comprise electrically coupling one or more loads with the tube and the centralizer separately. The one or more loads may include one or more sensors, one or more actuators, and/or other loads. The one or more sensors may include one or more of a temperature sensor, a pressure sensor, a flow rate sensor, a voltage sensor, and/or other sensors. The one or more actuators may include a valve, and/or other actuators. The one or more loads may communicate with an interior of the tube. The one or more loads may generate output signals conveying information related to operation of a well. The information related to the operation of the well may include one or more of information related to a temperature in the tube, a pressure in the tube, a flow rate of material through the tube, the operational state of a valve (e.g., open, closed, partially open), and/or other information. The method may comprise providing a signal path for the output signals with one or more of the tube, the centralizer, or the casing.

In some implementations, the wellbore electrical isolation system in the method described above may be a pup joint assembly. The first end and the second end of the tube in the method described above may be threaded such that the system may be coupled in line with a tubing string.

These and other features, and characteristics of the present technology, as well as the methods of operation and functions of the related elements of structure and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention. As used in the specification and in the claims, the singular form of "a", "an", and "the" include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a well configured to communicate liquid and/or gas from an underground reservoir to above ground extraction equipment at or near a wellhead.

FIG. **2** illustrates a cross sectional view of a wellbore electrical isolation system.

FIG. **3** illustrates a cross sectional view of an implementation of the wellbore electrical isolation system that includes one or more electrical loads.

FIG. **3A** illustrates an electrical circuit formed by a tubing string, a load, a centralizer, a casing, and extraction equipment.

FIG. **4** illustrates a method for electrically isolating well components with a wellbore electrical isolation system.

DETAILED DESCRIPTION

FIG. **1** illustrates a well **2** configured to communicate liquid and/or gas from an underground reservoir to above ground extraction equipment **4** at or near a wellhead **6**. In some implementations, well **2** may include one or more wellbore electrical isolation systems **10**. In some implementations, systems **10** may be configured to electrically isolate one or more sections of an electrically conductive tubing string **8** from an electrically conductive wellbore casing **22**. Casing **22** may cooperate with tubing string **8** to form a coaxial transmission line. Electrical isolation of tubing string **8** from casing **22** may facilitate powering one or more electrical loads disposed within well **2** via the coaxial transmission line formed by casing **22** and tubing string **8** without the need for electrical wiring. Systems **10** may be configured such that voltage and/or current across tubing string **8** and casing **22** distally (e.g., down hole) from a first installation point **11** is sufficient to power additional loads located distally from first installation point **11**. In some implementations, systems **10** may be formed in and/or formed by pup joints. A pup joint may comprise a relatively short (relative to tubing string **8**) length of tube configured to couple in line with tubing string **8**.

FIG. **2** illustrates a cross sectional view of a wellbore electrical isolation system **10**. In some implementations, wellbore electrical isolation system **10** may comprise a tube **12**, an electrically insulating layer **14**, a centralizer **16**, a first electrically insulating confinement device **18**, a second electrically insulating confinement device **20**, and/or other components.

Tube **12** may be configured to communicate liquid and/or gas during mineral extraction. Tube **12** may have a first end **13** and a second end **15**. A first box **17** at first end **13** and a second box **19** at second end **15** may comprise threaded portions of tube **12** such that tube **12** may be coupled in line with a tubing string (e.g., tubing string **8** shown in FIG. **1**). The tubing string may be configured to communicate the liquid and/or gas from an underground reservoir to above ground extraction equipment. Tube **12** and/or the tubing string may be made from electrically conductive materials such as steel and/or other electrically conductive materials.

Electrically insulating layer **14** may be configured to cover at least a portion of an outside diameter of tube **12** between first end **13** and second end **15**. For example, insulating layer **14** may cover a portion of the outside diameter of tube **12** that is about six feet long. Insulating layer **14** may be formed from electrically insulating materials including ceramics, polymers, and/or other insulating materials. For example, insulating layer **14** may be formed from polymer materials such as polyether ether ketone (PEEK), relatively tough (e.g., less brittle) ceramics, and/or other materials. In some implementations, insulating layer **14** may be applied during manufacture of system **10** and/or at other times. In some implementations, insulating layer **14** may self-adhere to tube **12**. In some implementations, insulating layer **14** may be coupled with tube **12** via one or more coupling devices. The one or more coupling devices may include, for example, a clamp, a collar, a latch, a hook, adhesive, and/or other devices. For example, insulating layer **14** may be sprayed onto tube **12**, painted onto tube **12**, adhered to tube **12** with an adhesive, clamped to tube **12** with one or more clamps, and/or attached to tube **12** via other methods.

Centralizer **16** may be configured to couple with insulating layer **14**. Centralizer **16** may couple with insulating layer **14** via one or more coupling devices of the centralizer and/or one or more external coupling devices. The coupling devices of the centralizer and/or the one or more external coupling device may include, for example, a clamp, a collar, a latch, a hook, adhesive, and/or other coupling devices. Centralizer **16** may be made from electrically conductive materials such as steel and/or other electrically conductive materials. Centralizer **16** may be configured to couple with insulating layer **14** such that centralizer **16** and tube **12** are electrically insulated from each other. Centralizer **16** may be configured to engage casing **22** to maintain a physical separation between tube **12** and casing **22**. Engagement between centralizer **16** and casing **22** may include an electrically conductive engagement. Insulating layer **14** between centralizer **16** and tube **12** may electrically isolate tube **12** from casing **22**.

Centralizer **16** may include a bow spring centralizer, a torque engaged centralizer, and/or other centralizers. A bow spring centralizer may have a first collar **42** at a first end **44** and a second collar **46** at a second end **48**. In some implementations, first collar **42** may be located proximally (up hole) relative to second collar **46** located distally (down hole) in the wellbore. In some implementations, first collar **42** and second collar **46** may be hinged. First collar **42** and second collar **46** may secure the bow spring centralizer to insulating layer **14**. The first hinged collar and the second hinged collar may be coupled together via bow springs **50** arranged circumferentially around collars **42** and **46**. The bow springs may bow such that the bow spring centralizer has a maximum diameter **52** at or near a mid-point **54** between first collar **42** and second collar **46**. Individual ones of bow springs **50** may engage casing **22** to maintain a physical separation between tube **12** and casing **22** at or near maximum diameter **52** of the bow spring centralizer.

Movement of centralizer **16** longitudinally along tube **12** may be confined by first electrically insulating confinement device **18** toward first end **13** of tube **12** and second electrically insulating confinement device **20** toward second end **15** of tube **12**. First electrically insulating confinement device **18** and second electrically insulating confinement device **20** may be formed from electrically insulating materials such as ceramics, polymers, and/or other insulating materials. The electrically insulating materials may be configured to withstand the operating conditions within a subsurface wellbore for the extraction of fossil fuels. For example, the electrically insulating materials may be configured such that they do not melt or deform when exposed to elevated temperatures. First confinement device **18** may be a first sleeve surrounding tube **12** disposed between centralizer **16** and first end **13**. Second confinement device **20** may be a second sleeve surrounding tube **12** disposed between centralizer **16** and second end **15**.

Tube **12** and/or the tubing string (e.g., tubing string **8** shown in FIG. **1**) may be provided within casing **22**. Casing **22** may surround tube **12**, insulating layer **14**, centralizer **16**, first confinement device **18**, second confinement device **20**, and/or other components of system **10**. Providing tube **12** within casing **22** may create an inner annular space **40** between the outer surface of tube **12** and casing **14**. Centralizer **16** may be configured to maintain tube **12** in annular space **40** to maintain the physical separation between tube **12** and casing **22**. Casing **22** may line the wellbore and provide structural support to the wellbore. Casing **22** may separate the well from subsurface materials (e.g., rocks, dirt, etc.), water (e.g., in the case of a well in the ocean floor), and/or other environmental materials. Casing **22** may be made from a conductive material such as steel and/or other conductive materials.

FIG. **3** illustrates a cross sectional view of an implementation of system **10** that includes one or more electrical loads **24**. One or more loads **24** may be electrically coupled with tube **12** and centralizer **16** separately. One or more loads **24** may include one or more sensors, one or more actuators, and/or other loads. The one or more sensors may include one or more of a temperature sensor, a pressure sensor, a flow rate sensor, a voltage sensor, and/or other sensors. The one or more actuators may include a valve, and/or other actuators. In some implementations, one or more of the loads may communicate with an interior of tube **12**. In some implementations one or more of the loads may communicate with the interior of tube **12** via a communication port coupled with one or more of the loads and the interior of tube **12**. The one or more loads **24** may be configured to generate output signals conveying information related to operation of a well (e.g., well **2** shown in FIG. **1**). The information related to the operation of the well may include one or more of information related to a temperature in tube **12**, a pressure in tube **12**, a flow rate of material through tube **12**, the operational state of a valve (e.g., open, closed, partially open), and/or other information. In some implementations, tube **12**, centralizer **16**, casing **22**, the tubing string (e.g., tubing string **8** shown in FIG. **1**), and/or other components of the well may be configured to provide a signal path for the output signals.

In some implementations, one or more loads **24** may be disposed in a load cavity **30** of system **10**. Load cavity **30** may comprise a vacant space configured to receive and/or couple with one or more loads **24**. Load cavity **30** may communicate with the communication port. Load cavity **30** may include pathways and/or channels such that loads **24** may be electrically coupled with tube **12** and centralizer **16** separately as described above. In FIG. **3**, load cavity **30** is illustrated within insulating layer **14**. This is not intended to be limiting. Load cavity **30** may be located anywhere in system **10** that allows one or more loads **24** to function as described herein.

Returning to FIG. **1**, as described above, casing **22** may cooperate with tubing string **8** to form a coaxial transmission line. Electrical isolation of tubing string **8** from casing **22** may facilitate powering one or more electrical loads disposed within well **2** via the coaxial transmission line formed by casing **22** and tubing string **8**. In some implementations, tubing string **8** may have a positive polarity and casing **22** may have a negative polarity. By way of the electrical engagement between casing **22** and centralizer **16** (shown in FIG. **2**), centralizer **16** may also have a negative polarity. In some implementations, an electrical load, (e.g., one or more loads **24** that may include sensors and/or actuators, and/or other loads) may be electrically coupled with the electrically positive tubing string **8** and separately with the electrically negative centralizer **16** (shown in FIG. **2**). Centralizer **16** (shown in FIG. **3**) and tubing string **8** may be electrically isolated from each other by insulating layer **14** (shown in FIG. **3**) covering at least a portion of tube **12** (shown in FIG. **3**). This arrangement may allow additional electrical loads to be deployed in the same and/or similar manner distally (down hole).

For example, FIG. **3**A illustrates an electrical circuit **300** formed by an electrical pathway provided by tubing string **8**, a load **24**, centralizer **16**, casing **22**, and extraction equipment **4**. Extraction equipment **4** may include a power supply. In the example shown in FIG. **3**A, the electrical pathway provided by tubing string **8** may have a positive polarity and the electrical pathway provided by casing **22** may have a negative polarity. By way of the electrical engagement **302** between casing **22** and centralizer **16**, the electrical pathway provided by centralizer **16** may also have a negative polarity. In some implementations, electrical load **24** may be electrically coupled with the electrically positive tubing string **8** at location **304** and separately at location **306** with the electrically negative centralizer **16**.

Returning to FIG. **1**, in some implementations, extraction equipment **4** may include equipment configured to manage operation of well **2**. Managing the operation of well **2** may include drawing liquid and/or gas through well **2**, storing the liquid and/or gas, monitoring well **2**, powering well **2**, preparing well **2** for production, analyzing data related to the operation of well **2**, and/or other activities. Such equipment may include pumps, piping, wiring, liquid and/or gas storage devices, power supplies, data processing equipment (e.g., one or more computers and/or processors), communication equipment, cameras, and/or other extraction equipment. For example, a well power supply may be configured to supply a positive polarity to tubing string **8** and a negative polarity to casing **22**. As another example, one or more processors may be configured to determine one or more well parameters based on output signals from one or more loads disposed within the wellbore. Such well parameters may include, for example, a temperature, a pressure, a flow rate, and/or other parameters.

Wellhead **6** may be located at the surface of well **2**. Wellhead **6** may be configured to suspend tubing string **8** and/or casing **22** in well **2**. Wellhead **6** may be a structural interface between tubing string **8** and extraction equipment **4** configured to couple tubing string **8** with extraction equipment **4**. Wellhead **6** may be configured to contain pressure present in well **2**. Wellhead **6** may be configured to provide physical access to well **2** including access to annular space(s) (e.g., annular space **40** shown in FIG. **2**) between casing (e.g., casing **22**) and/or tubing strings (e.g., tubing string **8**). Wellhead **6** may be configured to provide electrical ports that are electrically coupled with tubing string **8** and/or casing **22**.

In some implementations, tubing string electrical insulation device **7** may electrically insulate tubing string **8** from wellhead **6**. In some implementations, tubing string electrical insulation device **7** may be configured to electrically insulate tubing string **8** from wellhead **6** magnetically, by physically separating metal in wellhead **6** from metal in tubing string **8**, and/or by other methods. In some implementations, tubing string electrical insulation device **7** may be and/or include a transformer, for example.

It will be appreciated by those having ordinary skill in the art that tubing string **8** may take different forms depending on the state of the wellbore. Thus, for example, tubing string **8** may comprise a production tubing string in a completed wellbore or a drillstring in a wellbore under construction.

FIG. **4** illustrates a method **400** for electrically isolating well components with a wellbore electrical isolation system. In some implementations, the wellbore electrical isolation system may be a pup joint assembly. The operations of method **400** presented below are intended to be illustrative. In some implementations, method **400** may be accomplished with one or more additional operations not described, and/or without one or more of the operations discussed. Additionally, the order in which the operations of method **400** are illustrated in FIG. **4** and described herein is not intended to be limiting.

At an operation **402**, an electrically conductive tube may be covered with an electrically insulating layer. The tube may have a first end and a second end. At least a portion of an outside diameter of the tube between the first end and the second end may be covered with the insulating layer. In some implementations, the first end and the second end of the tube may be threaded. In some implementations, operation **402** may be performed by an insulating layer the same as or similar to insulating layer **14** (shown in FIG. **2** and described herein).

At an operation **404**, an electrically conductive centralizer may couple with the insulating layer. The coupling may be performed, for example, by a collar, latch, hook, and/or other components of the centralizer. The centralizer and the tube may be coupled such that they are electrically insulated from each other. In some implementations, operation **404** may be performed by a centralizer the same as or similar to centralizer **16** (shown in FIG. **2** and described herein).

At an operation **406**, movement of the centralizer longitudinally along the tube may be confined. Movement of the centralizer may be confined with a first electrically insulating confinement device toward the first end of the tube and a second electrically insulating confinement device toward the second end of the tube. In some implementations, operation **406** may be performed by confinement devices the same as or similar to confinement devices **18** and/or **20** (shown in FIG. **2** and described herein).

At an operation **408**, a conductive wellbore casing may be engaged to maintain a physical separation between the tube and the casing. The casing may be engaged with the centralizer. The electrical insulation between the centralizer and the tube may isolate the tube electrically from the casing. The casing may surround the tube, the insulating later, the centralizer, the first confinement device, the second confinement device, and/or other components of system **10**. In some implementations, operation **408** may be performed by a centralizer the same as or similar to centralizer **16** (shown in FIG. **2** and described herein).

At an operation **410**, one or more loads may electrically couple with the tube and the centralizer separately. The one or more loads may include one or more sensors, one or more actuators, and/or other loads. The one or more sensors may include one or more of a temperature sensor, a pressure sensor, a flow rate sensor, a voltage sensor, and/or other sensors. The one or more actuators may include a valve, and/or other actuators. In some implementations, one or more of the loads may communicate with an interior of the tube. In some implementations, the one or more loads may be configured to generate output signals conveying information related to operation of a well. The information related to the operation of the well may include one or more of information related to a temperature in the tube, a pressure in the tube, or a flow rate of material through the tube, the operational state of a valve (e.g., open, closed, partially open). In some implementations, operation **410** may be performed by one or more loads the same as or similar to loads **24** (shown in FIG. **3** and described herein).

At an operation **412**, a signal path for the output signals of the one or more loads may be provided. The signal path may be provided with the tube, the centralizer, the casing, and/or other components of the wellbore electrical isolation system. In some implementations, operation **412** may be performed by a tube, a centralizer, and/or a casing the same as or similar to tube **12**, centralizer **16**, and/or casing **22** (shown in FIG. **2** and described herein).

Although the present technology has been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred implementations, it is to be understood that such detail is solely for that purpose and that the technology is not limited to the disclosed implementations, but, on the contrary, is intended to cover modifications and equivalent arrangements that are within the spirit and scope of the appended claims. For example, it is to be understood that the present technology contemplates that, to the extent possible, one or more features of any implementation can be combined with one or more features of any other implementation.

What is claimed is:

1. A wellbore electrical isolation system, the system comprising:

an electrically conductive tube having a first end and a second end, wherein at least a portion of an outside diameter of the tube between the first end and the second end is covered with an electrically insulating layer; and

an electrically conductive centralizer, the centralizer being coupled to the insulating layer such that the centralizer and the tube are electrically insulated from each other, wherein movement of the centralizer longitudinally along the tube is confined by a first electrically insulating confinement device toward the first end of the tube and a second electrically insulating confinement device toward the second end of the tube, wherein the centralizer is configured to engage a conductive wellbore casing to maintain a physical separation between the tube and the casing, and wherein the electrical insulation between the centralizer and the tube isolates the tube electrically from the casing.

2. The system of claim **1**, wherein the casing surrounds the tube, the insulating layer, the centralizer, the first confinement device, and the second confinement device.

3. The system of claim **1**, wherein the wellbore electrical isolation system is a pup joint assembly.

4. The system of claim **1**, wherein the first end and the second end of the tube are threaded.

5. The system of claim **1**, further comprising one or more loads electrically coupled with the tube and the centralizer separately.

6. The system of claim **5**, wherein the one or more loads include one or more sensors and/or one or more actuators.

7. The system of claim **6**, wherein the one or more sensors include one or more of a temperature sensor, a pressure sensor, a flow rate sensor, or a voltage sensor.

8. The system of claim **6**, wherein the one or more loads communicate with an interior of the tube.

9. The system of claim **6**, wherein the one or more loads are configured to generate output signals conveying information related to operation of a well, the information related to the operation of the well including one or more of information related to a temperature in the tube, a pressure in the tube, or a flow rate of material through the tube.

10. The system of claim **9**, wherein one or more of the tube, the centralizer, or the casing are configured to provide a signal path for the output signals.

11. A method for electrically isolating well components with a wellbore electrical isolation system, the method comprising:

covering, with an electrically insulating layer, an electrically conductive tube having a first end and a second end, wherein at least a portion of an outside diameter of the tube between the first end and the second end is covered with the insulating layer;

coupling an electrically conductive centralizer to the insulating layer such that the centralizer and the tube are electrically insulated from each other;

confining movement of the centralizer longitudinally along the tube with a first electrically insulating confinement device toward the first end of the tube and a second electrically insulating confinement device toward the second end of the tube; and

engaging, with the centralizer, a conductive wellbore casing to maintain a physical separation between the tube and the casing, wherein the electrical insulation between the centralizer and the tube isolates the tube electrically from the casing.

12. The method of claim **11**, further comprising surrounding, with the casing, the tube, the insulating layer, the centralizer, the first confinement device, and the second confinement device.

13. The method of claim **11**, wherein the wellbore electrical isolation system is a pup joint assembly.

14. The method of claim **11**, wherein the first end and the second end of the tube are threaded.

15. The method of claim **11**, further comprising electrically coupling one or more loads with the tube and the centralizer separately.

16. The method of claim **15**, wherein the one or more loads include one or more sensors and/or one or more actuators.

17. The method of claim **16**, wherein the one or more sensors include one or more of a temperature sensor, a pressure sensor, a flow rate sensor, or a voltage sensor.

18. The method of claim **16**, further comprising communicating, with the one or more loads, with an interior of the tube.

19. The method of claim **16**, further comprising generating output signals conveying information related to operation of a well, the information related to the operation of the well including one or more of information related to a temperature in the tube, a pressure in the tube, or a flow rate of material through the tube.

20. The method of claim **19**, further comprising providing a signal path for the output signals with one or more of the tube, the centralizer, or the casing.

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